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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/814,177	04/01/2004	Mitsutoshi Nakajima	251393US2X	7393
22850 7590 04/16/2007 OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER DRODGE, JOSEPH W	
			ART UNIT	PAPER NUMBER
			1723	

SHORTENED STATUTORY PERIOD OF RESPONSE	NOTIFICATION DATE	DELIVERY MODE
3 MONTHS	04/16/2007	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 04/16/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary

Application No.

10/814,177

Applicant(s)

NAKAJIMA ET AL.

Examiner

Joseph W. Drodge

Art Unit

1723

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 February 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) 6-9 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3-5 and 10-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 6-9 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- 1) ☐ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Art Unit: 1723

Applicant's election with traverse of Species IV in the reply filed on 10/10/2006 is acknowledged. The traversal is on the ground(s) that the instant claims are all part of an overlapping search area and search of the entire application would not constitute a serious burden on the Examiner. This is not found persuasive because the non-elected Species each concern mutually exclusive and diverse technologies, requiring searches in respective different classes.

The requirement is still deemed proper and is therefore made FINAL.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was

Art Unit: 1723

not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1,2,4,5,10-13, 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al patent 6,258,858 in view of Brophy et al patent 7,118,920. Nakajima '858 discloses a microchannel apparatus comprising a substrate surface 3 having recess 4 extending from supply port 18 or 19, having a raised bank 21 adjacent the recess with plural microchannels 23 connecting from the recess to outside of the recess (figure 7). The width and height of the microchannels and ratio thereof are all within the claimed ranges (column 5, lines 39-42). The substrate surface is attached to a flat plate/cover 5 in a sealed arrangement such that liquid cannot escape (column 4, lines 60-62):

The claims all differ in requiring a component(s) or joining of components to each other to comprise resin, such resin having a surface contact angle with respect to water of 5 to 60 degrees. However, Brophy (column 11, line 42-column 12, line 4, in particular column 11, lines 61-64) teaches that it is well known to make microchannel materials of resin material, since these are amenable to being engineered to tight tolerances and different degrees of hydrophobicity or hydrophilicity can be imparted.

Brophy teaches in column 5 lines 1-11, column 10, lines 27-44 and column 11, line 64-column 12, line 1 that hydrophilicity resulting in contact angles of less than 90 degrees is an intrinsic property of materials and material surface treatments used in preparing microchannel devices. Brophy also teaches to vary the contact angle of

Art Unit: 1723

substrate surface relative to water or other fluid being handled as a degree of imparted hydrophilicity or hydrophobicity. Brophy teaches in column 11, lines 31-37 and column 12, lines 2-5 to utilize relatively low contact angle materials such as polymethacrylates and to use surface treatments such as coating with polymer coatings and treating with electron beams or plasma to increase the hydrophilicity of microchannel surfaces and lower the contact angle thereof, inherently to below 60 degrees. If necessary, page 12, lines 1-16 of the Specification indicates that such material and surface treatments result in such low contact angles.

It would have been obvious to one of ordinary skill in the art to have utilized resin materials for one or more of the '858 layers/surfaces, as taught by Brophy, to allow engineering to tight tolerances and impart desired degree of hydrophilicity and hydrophobicity for the particular materials being handled by the apparatus. It would have also been obvious to one of ordinary skill in the art to have rendered the surface of the resin substrate to have the recited low contact angle and have such degree of hydrophilicity, in order to enable the treated emulsion droplets and continuous phase and formed product fluids to wet to and adhere to a surface of like polarity and to resist beading and formation of a dispersed emulsion or unwanted droplets.

The claims also differ in requiring the substrate surface and flat cover plate to be attached in a firm manner. However, Brophy teaches in column 3, lines 21-38 to use resin bonding so as to hold the different layers of the structure together.

For claims 4 and 15, see structures 22 of '858 defining the microchannels which comprise raised surfaces.

For claims 5 and 16, Brophy teaches placing a plurality of substrates on top of each other in close contact, forming multiple microchannels in column 3, lines 23-38 so as to enable the apparatus to conduct multi-step processes or processes concerning mixing, combining of multiple phases/fluids.

For claims 10 and 11, '858 discloses sending a 1st fluid from inside of the recess, through the microchannels so as to be dispersed in a second fluid on the outside of the recess, without mixing (column 6, lines 15-34) and for claim 11, the cover plate being made of glass, hence transparent (column 4, line 61).

Claims 3 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakajima et al patent 6,258,858 in view of Brophy et al patent 7,118,920 as applied to claim 1,3,4,5,10 and 11 above, and further in view of Gason et al PG PUBS Document US2005/0199500. Claims 3 and 14 further differ in explicitly requiring the surfaces/structures to include microchannels having an edge angle of 90 degrees or less. But, Gason et al teach in paragraph 153 a microchannel-containing structure with the channels having low edge angles, and teaching motivation to provide such low edge angles to minimize fluid inertia in movement of the fluids.

Applicant's arguments filed on February 14 have been fully considered but they are not persuasive. It is argued that Brophy et al does not disclose or suggest the claimed contact angle of between 5 and 60 degrees, or motivation therefor. However,

Art Unit: 1723

such contact angle range is an intrinsic or inherent property of the materials utilized in Brophy, especially of non-polar plastics, and particularly with the surface treatments taught in Brophy of plasma and high energy electron beam treatment or coating with plasma-treated polymer (column 11, lines 32-40 and column 12, lines 2-7). Express motivation to achieve such contact range and hydrophilicity is expressed in column 10, lines 40-46 of Brophy.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Joseph Drodge at telephone number 571-272-1140. The examiner can normally be reached on Monday-Friday from 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steve Griffin, can be reached at 571-272-1189. The fax phone number for the examining group where this application is assigned is 571-273-8300.


Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information

Art Unit: 1723

for published applications may be obtained from either private PAIR or Public PAIR, and through Private PAIR only for unpublished applications. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have any questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JWD

April 7, 2007


JOSEPH DODGE
PRIMARY EXAMINER